

REMARKS

Claims 1-6 are pending.

A Declaration under 37 C.F.R. § 1.132 is being filed concurrently with this Response.

Claims 1-5 are rejected under 35 U.S.C. § 103(a) as being unpatentable over DE 3300865 to Puetter et al. (hereinafter DE '865) in view of U.S. Patent No. 5,435,830 to Senda et al. (hereinafter Senda). Applicants traverse.

The Examiner contends that DE '865 teaches a process for the production of aqueous TiCl_3 solution by cathodic electrolytic reduction of TiCl_4 solution in a cell. The Examiner avers that DE '865 teaches controlling the conversion percentage for TiCl_3 solution under different conditions, which reads on the claimed predetermined existing ratio of trivalent titanium ions and tetravalent titanium ions. The Office Action acknowledges that DE '865 does not explicitly teach producing fine metal powder having a particle diameter corresponding to the existing ratio of the trivalent titanium ions and the tetravalent titanium ions. The Office Action relies on Senda in an attempt to cure the admitted deficiencies of DE '865.

The Examiner avers that the metal reduction for the fine metal powder depends on the amount of trivalent titanium ions. The Examiner contends that the fine metal powder has no direct relation with tetravalent titanium ions. The Examiner concludes that the particle diameter and the ratio of $\text{TiCl}_3/\text{TiCl}_4$ is the same as the relationship between particle diameter and amount of TiCl_3 in solution. The Office Action states that the amount of TiCl_3 is a result-effective variable in terms of diameter of metal particles, which is evidenced by Senda.

In line 20 of page 3 through line 1 of page 4, the Office Action states:

However, the metal reduction for fine metal particle [*sic*] depends on the amount of trivalent titanium ions and has no directly [*sic*] relation with tetravalent titanium ions.

Further, in the Advisory Action mailed May 15, 2008, the Examiner contends that Senda teaches using a different amount of Ti(III) solution to obtain different metal particles with diameters, specifically relying on Embodiments 1 through 12 of Senda. The Examiner contends that Senda clearly teaches the metal and non-metal compound or the complex is reduced by Titanium trichloride. The Examiner concludes that the relationship between particle diameter and the ratio of Ti(III)/Ti(IV) is the same as the relationship between particle diameter and the amount of Ti(III) in the solution.

As an initial matter, the Examiner's conclusory statements of obviousness are not sufficient to establish a prima facie case of obviousness. Thus, the Office Action is setting forth a motivational rationale not supported by the record, but rather based solely on the Examiner's belief of what one skilled in the art may have tried or recognized.

However, to set forth a rejection including Official Notice, the rejection must include some form of evidence in the record to support an assertion of common knowledge. If Official Notice is taken of a fact, unsupported by documentary evidence, then the basis for such reasoning must be set forth explicitly. The Examiner must provide specific factual findings predicated on sound technical and scientific reasoning to support his or her conclusion of common knowledge. *See*, MPEP 2144.03(B) and (C) and 37 C.F.R. 1.104(d)(2). If the Examiner believes that the claimed particle diameter of the existing ratio of the trivalent titanium ions and the tetravalent titanium ions corresponds to the amount of Ti(III) in the solution of Senda, the Examiner is specifically requested to provide **objective evidence**. Failure to provide objective evidence to support implicit official notice when challenged constitutes ground for reversal. *Ex parte Natale*, 11 USPQ2d 1222 (BPAI 1988); *Ex parte Nouel*, 158 USPQ 237 (Bd.App. 1967).

It is well settled that “the Board [and the Examiner] cannot simply reach conclusions based on [their] own understanding or experience - or on [their] assessment of what would be basic knowledge or common sense. Rather the Board [and the Examiner] must point to some concrete evidence in the record in support of these findings.” *In re Zurko*, 258 F. 3d 1379, 1386 (Fed. Cir. 2001). *See also, In re Lee*, 277 F. 3d 1338, 1344-45 (Fed. Cir. 2002), in which the court required evidence for the determination of unpatentability by clarifying that the principles of “**common knowledge**” and “**common sense**” may only be applied to the analysis of evidence, rather than be a substitute for evidence.

Contrary to these requirements, the outstanding Office Action provides no sound technical and scientific reasoning to support the above-recited Official Notice. The relied upon motion must be evidenced in the record, and cannot be based merely on an opinion of the Examiner.

There is no apparent factual basis upon which to predicate the conclusion that any such capability is inherent, i.e., is **necessarily** present, in the titanium-free powders disclosed by Senda.

In Embodiments 1 to 12 of Senda, trivalent titanium ions were used as a reducing agent to produce fine metal powders formed of different types of metal, respectively, as shown in Table A below. Table A details the amount of TiCl_3 , type of metal, and particle diameter disclosed in Embodiments 1 to 12 of Senda (*see, e.g.*, Embodiments 1 to 12 and the corresponding description in col. 3, line 1 – col. 5, line 23).

TABLE A

	TiCl ₃ (mole/liter)	Type of Metal	Particle Diameter (μm)
Embodiment 1	0.03	Pb	0.4-0.5
Embodiment 2	0.03	Sb	0.5
Embodiment 3	0.04	In	0.8
Embodiment 4	0.04	Cd	0.5
Embodiment 5	0.04	Ni	0.8
Embodiment 6	0.04	Sn-Pb	1.0
Embodiment 7	0.04	Re	1.0
Embodiment 8	0.04	Mo	0.8
Embodiment 9	0.04	Se	0.8
Embodiment 10	0.04	Te	0.8
Embodiment 11	0.04	Cu	0.65
Embodiment 12	0.04	CdS	0.8

It is well known by persons skilled in the art that the particle diameters of the produced fine metal powders are *different* from one another, not because of the amounts of trivalent titanium ions were different, but because the *types of metal forming* the fine metal powders were *different*.

For example, in Embodiments 1 and 2 of Senda, the amounts of trivalent titanium ions are the same in 0.03 mole/liter. However, the particles diameters of the formed fine metal powders are *different* since the types of metal are *different*. Similarly, in Embodiments 3 to 12,

all of the amounts of titanium ions are the **same** in each 0.04 mole/liter sample. However, the particle diameters of the formed fine metal powders are *different* since the types of metal are *different*.

Contrary to this, in the present claimed subject matter, trivalent titanium ions and tetravalent ions coexist in a mixed solution as a reaction system, and at the same time, the molar ratios of both of the ions are changed, to form fine metal powders of the same metal that *only* differ in their particle diameter size.

In the claimed subject matter, when the types of metal are different, the particle diameters of produced fine metal powders are different. However, fine metal powders formed of the same metal that differ only in their particle diameter size are produced by changing the ratio between trivalent titanium ions and tetravalent titanium ions. That is, Senda *only* produces a fine metal powder having a *constant* particle diameter. In contrast, the claimed method adjusts the size of the *particle diameter* of a produced fine metal powder by adjusting the molar ratio between the trivalent titanium ions **and** tetravalent titanium ions, not the amounts of trivalent titanium ions. Accordingly, the range is different per metal.

Declaration Under 37 C.F.R. § 1.132

Applicants submit concurrently herewith, an executed Declaration by co-inventor Keiji Koyama, to further demonstrate that the particle diameter of a produced fine metal powder is changed by adjusting the molar ratio between the trivalent titanium ions **and** tetravalent titanium ions, not the amounts of trivalent titanium ions, as disclosed in Experiment 2 of the Declaration. The Declaration further demonstrates that trivalent titanium ions and tetravalent titanium ions coexist in a mixed solution as a reaction system, and at the same time, the test conditions were

kept constant except that the molar ratios of both of the ions were changed, as disclosed in Table

1. Specifically, the Declaration clearly demonstrates that the claimed method produces fine metal powders formed of the same metal, nickel.

In Experiment 2, Comparative Example 2 of the present application, in which a mixed solution as a reaction system contains trivalent titanium ions alone and does not contain tetravalent titanium ions was performed (pg. 6, lines 18-21 of the Declaration). Further, Experiment 2 was performed in the same manner as Comparative Example 2 of the present application, except that molar concentrations (mole/liter) of trivalent titanium ions were changed in Samples 2-2 through 2-7, and fine metal powders formed of the same type of metal (nickel) were produced (pg. 7, lines 20-24 of the Declaration). The particle diameter of the produced fine metal powders (fine nickel powders) was always constant irrespective of the concentrations of trivalent titanium ions in Samples 2-2 through 2-7, as shown in Table 2 and Fig. 2 of the Declaration (pg. 6, line 3 – pg. 7, line 13 of the Declaration).

As a result, tetravalent titanium ions produced by the reaction does not influence the particle diameter of a fine metal powder (pg. 10, lines 11-14 of the Declaration). Consequently, even when the concentration of trivalent titanium ions is changed, a deposited amount of a fine metal powder is merely changed, not its particle diameter (pg. 10, lines 14-17).

Thus, the Examiner's conclusion that the metal reduction for the fine metal powder depends on the amount of trivalent titanium ions is *erroneous*.

In the Advisory Action mailed May 15, 2008, the Examiner indicates that the Applicants have no evidence to prove that the relationship between the ion concentration (%) of the trivalent titanium ions and the average particle diameter (nm) of the fine metal powders must have a linear shape. The Examiner indicates that only five data points are shown in Fig. 1 of the instant

application, and contends that the four data points found below the 80% concentration of trivalent titanium ions could also be treated as a linear curve if error factors were considered. The Examiner indicates that further evidence to support the Applicants' argument is needed.

As shown in Table 1 and Fig. 1 of the Declaration, and Fig. 1 of the instant application, the size of the particle diameters changes in a *S-shaped curve* according to the molar ratios between trivalent titanium ions and tetravalent titanium ions. Table 1 of the Declaration has **nine** samples, 1-1 through 1-9, which is an increase from the five samples found in the instant application. A 20% hydrochloric acid solution of titanium tetrachloride was prepared (pg. 2, lines 15-16 of the Declaration). The molar ratio of the sum of trivalent and tetravalent titanium ions to the total amount of the mixed solution is 0.2 M (mole/liter) when a reducing agent solution was subjected to cathode electrolytic treatment, subsequently mixed with a reaction solution at a predetermined ratio, and a pH adjuster or ion-exchanged water was added to produce a predetermined amount of mixed solution (pg. 2, lines 16-25 of the Declaration).

The solution was then poured into one of the cells in a two-cell type electrolytic cell divided by an anion exchange membrane (pg. 2, lines 26-28 of the Declaration). A sodium sulfate solution having a molar ratio of 0.1 M was poured into the other cell (pg. 2, line 28 – pg. 3, line 2 of the Declaration). Tetravalent titanium ions were reduced to trivalent titanium ions using eight different reducing agent solutions, Samples 1-2 to 1-9 (pg. 3, lines 3-5 and Table 1 of the Declaration). Carbon felt electrodes were dipped in a solution of titanium tetrachloride used as a cathode, such as, Samples 1-2 to 1-9 and a sodium sulfate solution as an anode (pg. 3, lines 5-10 of the Declaration).

A comparative example, Sample 1-1, contained an aqueous solution in which an anode electrolytic treatment was not performed and the amount of trivalent titanium ions was 0% (pg.

3, lines 11-14 and Table 1 of the Declaration). To produce a reaction solution, nickel chloride and trisodium citrate were dissolved in ion-exchanged water (pg. 3, lines 15-17 of the Declaration). The amount of the nickel chloride was set such that the molar ratio thereof to the total amount of the mixed solution would remain 0.16 M (pg. 3, lines 16-20 of the Declaration). The amount of trisodium citrate was adjusted so the molar ratio of the trisodium citrate to the total amount of the mixed solution would be 0.3 M (pg. 3, lines 20-22 of the Declaration).

Each of the nine types of reducing agent solutions (Samples 1-1 to 1-9) was poured into a reaction cell and was agitated while maintaining a liquid temperature at 50°C (pg. 3, lines 24-26 of the Declaration). A saturated solution of sodium carbonate serving as a pH adjuster was added to the solution to adjust the pH of the solution to 5.2, the reaction solution was gradually added to the solution, and ion-exchanged water was further added as required, to produced a predetermined amount of mixed solution (pg. 3, line 26 – pg. 4, line 4 of the Declaration). The reaction solution and the ion-exchanged water, which had been previously warmed to 50°C, were added (pg. 4, lines 4-6 of the Declaration).

The mixed solution was agitated for several minutes while maintaining the liquid temperature at 50°C and sediments were deposited in each of the Samples 1-2 to 1-9 (pg. 4, lines 6-10 of the Declaration). The agitation was stopped to immediately filter, rinse, and dry the sediments to obtain fine, nickel powders (pg. 4, lines 10-12 of the Declaration). At the end of the reaction, the pH of the mixed solution was 4.0 (pg. 4, lines 12-13 of the Declaration). Almost all of the titanium ions in the mixed solution were tetravalent (pg. 4, lines 14-15 of the Declaration). Sediments were not deposited in Sample 1-1 because the 100% tetravalent titanium ions did not produce fine metal powders (pg. 4, lines 15-16 of the Declaration).

Using a scanning-type electron microscope, the particle diameter size of all of the fine metal powders was measured within a rectangular shaped area of $0.8\ \mu\text{m} \times 2.4\ \mu\text{m}$ and averaged (pg. 4, lines 17-22 of the Declaration). The average particle diameter for each of the fine metal powders for Samples 1-2 to 1-9 is shown in Table 1 of the Declaration. The relationship between the mole percentage of trivalent titanium ions in the reducing agent solution and the average particle diameter (nm) of the fine metal powders is shown in Fig. 1 of the Declaration.

For example, Table 1 of the Declaration shows that the average particle diameter of the fine metal powder for Sample 1-2 containing 10 molar % trivalent titanium ions and 90 molar % tetravalent titanium ions is 20 nm, the average particle diameter of the fine metal powder for Sample 1-3 containing 20 molar % trivalent titanium ions and 80 molar % tetravalent titanium ions was 100 nm, and the average particle diameter of the fine metal powder for Sample 1-7 containing 80 molar % trivalent titanium ions and 20 molar % tetravalent titanium ions was 450 nm. Table 1 and Fig. 1 of the Declaration confirm that a particle diameter of a produced fine metal powder can be changed by making trivalent titanium ions and tetravalent titanium ions coexist in a mixed solution serving as a reaction system, and by adjusting a molar ratio between both of the ions (pg. 5, line 1 – pg. 6, line 2 of the Declaration).

Applicants submit that the data presented in the Declaration supports Applicants' position that a particle diameter of a produced fine metal powder is changed by making trivalent titanium ions and tetravalent titanium ions in a reducing agent solution, and at the same time, by adjusting a molar ratio between both of the ions. The Declaration demonstrates that by adjusting a molar ratio between trivalent titanium ions and tetravalent titanium ions produces a fine metal powder having a certain particle diameter with a good reproducibility.

As DE '865 and Senda do not disclose the same method of producing a fine metal powder as disclosed by the present inventors, and even if combined still fail to disclose or suggest the elements recited by claim 1, the combination of DE '865 and Senda do not render the method of producing a fine metal powder as recited by claim 1 obvious.

Obviousness can be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge readily available to one of ordinary skill in the art. *In re Kotzab*, 217 F.3d 1365, 1370 55 USPQ2d 1313, 1317 (Fed. Cir. 2000); *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). There is no suggestion in Senda to add tetravalent titanium ions to trivalent titanium ions to form a fine metal powder, or to modify the existing ratio of the trivalent titanium ions and the tetravalent titanium ions to correspond to a particle diameter of the fine metal powder, nor does common sense dictate the Examiner-asserted modifications. The Examiner has not provided any evidence that there would be any obvious benefit in making the asserted modification of Senda. *See KSR Int'l Co. v. Teleflex, Inc.*, 127 S.Ct. 1727, 82 USPQ2d 1385 (2007).

The only teaching of the process of forming a fine metal powder by subjecting a solution of tetravalent titanium ions to trivalent titanium ions and the claimed particle diameter is found in Applicants' disclosure. However, the teaching or suggestion to make a claimed combination and the reasonable expectation of success must not be based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Application No.: 10/517,821

Claim 6 is rejected under 35 U.S.C. § 103(a) as being unpatentable over DE '865 in view of Senda, and further in view of U.S. Patent No. 5,409,581 to Harrison et al. (hereinafter Harrison).

Dependent claim 6 is allowable for at least for the same reasons as independent claim 1, and further distinguishes the claimed method of producing a fine metal powder.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

McDERMOTT WILL & EMERY LLP



Lisa A. Kilday
Registration No. 56,210

600 13th Street, N.W.
Washington, DC 20005-3096
Phone: 202.756.8000 BKS:LAK:lnm
Facsimile: 202.756.8087
Date: July 7, 2008

**Please recognize our Customer No. 20277
as our correspondence address.**